6-Troubleshooting

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Introduction to NMM-3 Troubleshooting

This document is intend to be a guide for localizing and repairing electrical faults in the NMM-3 device. First there is a brief guide for fault localizing. Then fault repairing is divided into troubleshooting paths.

Before any service operation you must be familiar with the NMM-3 product and module level architecture. You should also be familiar with the NMM-3 specified service tools such as the Phoenix service software, flashing tools and software.

General guidelines for NMM-3 trouble shooting

Tools needed for troubleshooting

- Service tools (as listed at service tools chapter in service manual)
- Laboratory power supply with current indicator
- Oscilloscope
- Digital multimeter ...

General guidelines

If the device cannot be turned on by any means, see "dead device" trouble shooting

Current consumption (missing consumption) gives an idea whether the device is able to start up.

Dropping supply voltage or very large current consumption indicates a short circuit

Check whether the connection with Phoenix works and what can be discovered with Phoenix (ADC-readings, baseband selftest, bb-calibrations etc.)

Check baseband selftests with Phoenix if "CONTACT SERVICE" is shown on the display.

Check visually display and rocker faults

Force phone to LOCAL mode and make keyboard test by phoenix

Check that board-to-board connector is OK, and connectors make good contacts.

If liquid damage, stop repairing!

Flash phone before disassembling it if fault is not obvious and Phoenix connection is OK.

Disassemble phone:

Try to locate failed module, is it Engine, UI or camera module.

Check failed module visually:

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Mechanical damages?

Solder joints OK?

Continue with specific trouble shooting procedure for the module:

If there is an obvious fault, repair it before reflashing the device

Flash first if a fault is not obvious

If flashing is not working go to flashing trouble shooting

Due to CSP packages short circuits or broken solder joints are not easily seen. If the examined signal seems to be continuously in low or high level, then measure for possible short circuit to ground (signal low) or to supply voltage (signal high) Note that if a problem is not found from any visible contact/component it can be under CSPs where the signal is connected.

Care must be taken when assembling and disassembling the transceiver. Failure to do this may result in unnecessary damage to device.

Nominal current consumption

NOTE: Service tools need some amount of current to work.

The following current consumption values are measured from a complete NMM-3.

Vbatt = 3.6V

Measured nominal currents are drawn from the main battery.

Measurements have been made with a current probe connected to an oscilloscope.

Operating mode	Current consumption
Idle	90 mA
2w audio call (backlights off)	350 mA
Viewfinder	260 mA

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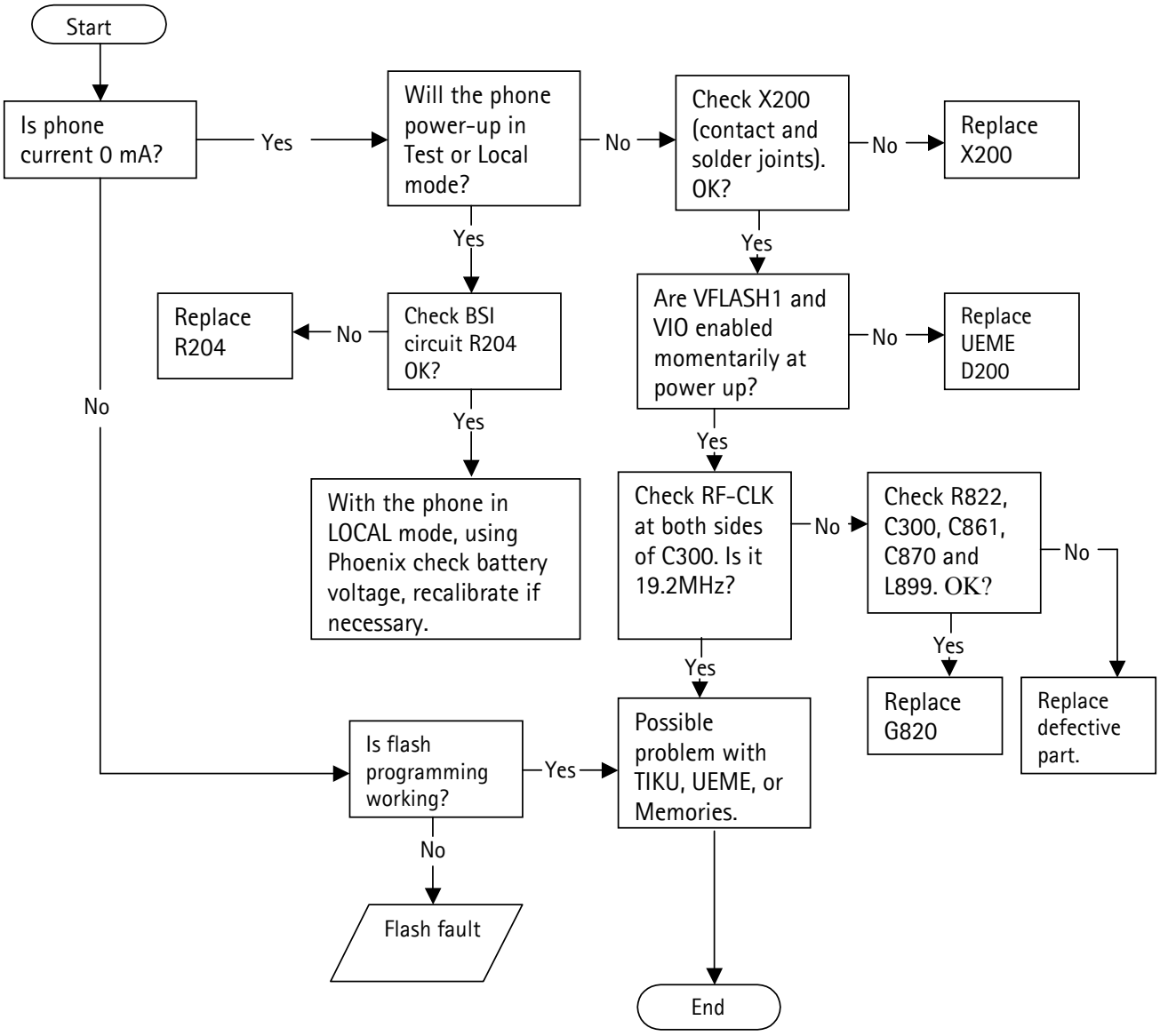
Diagnostics

Phone is Dead



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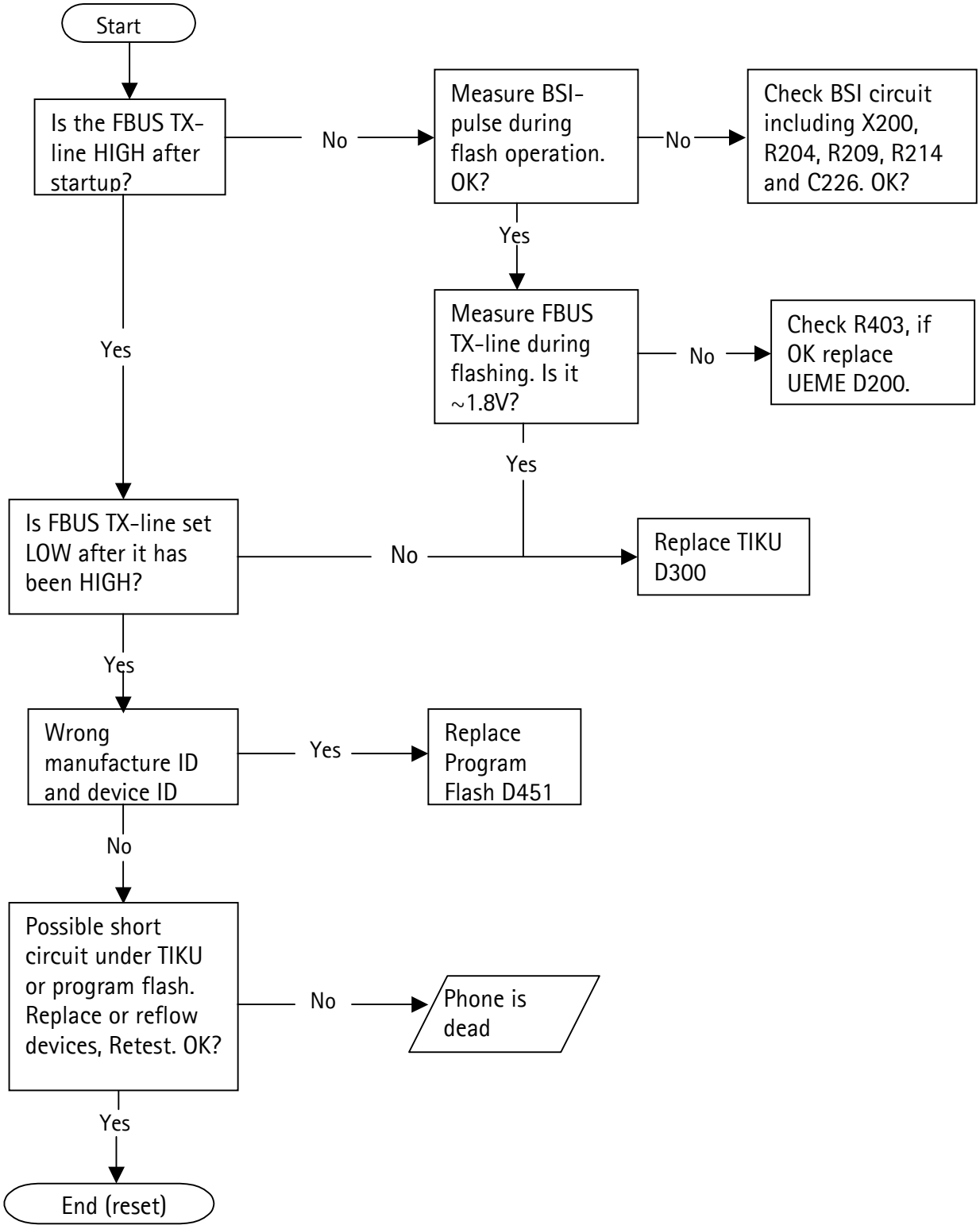
Flash Programming Fault



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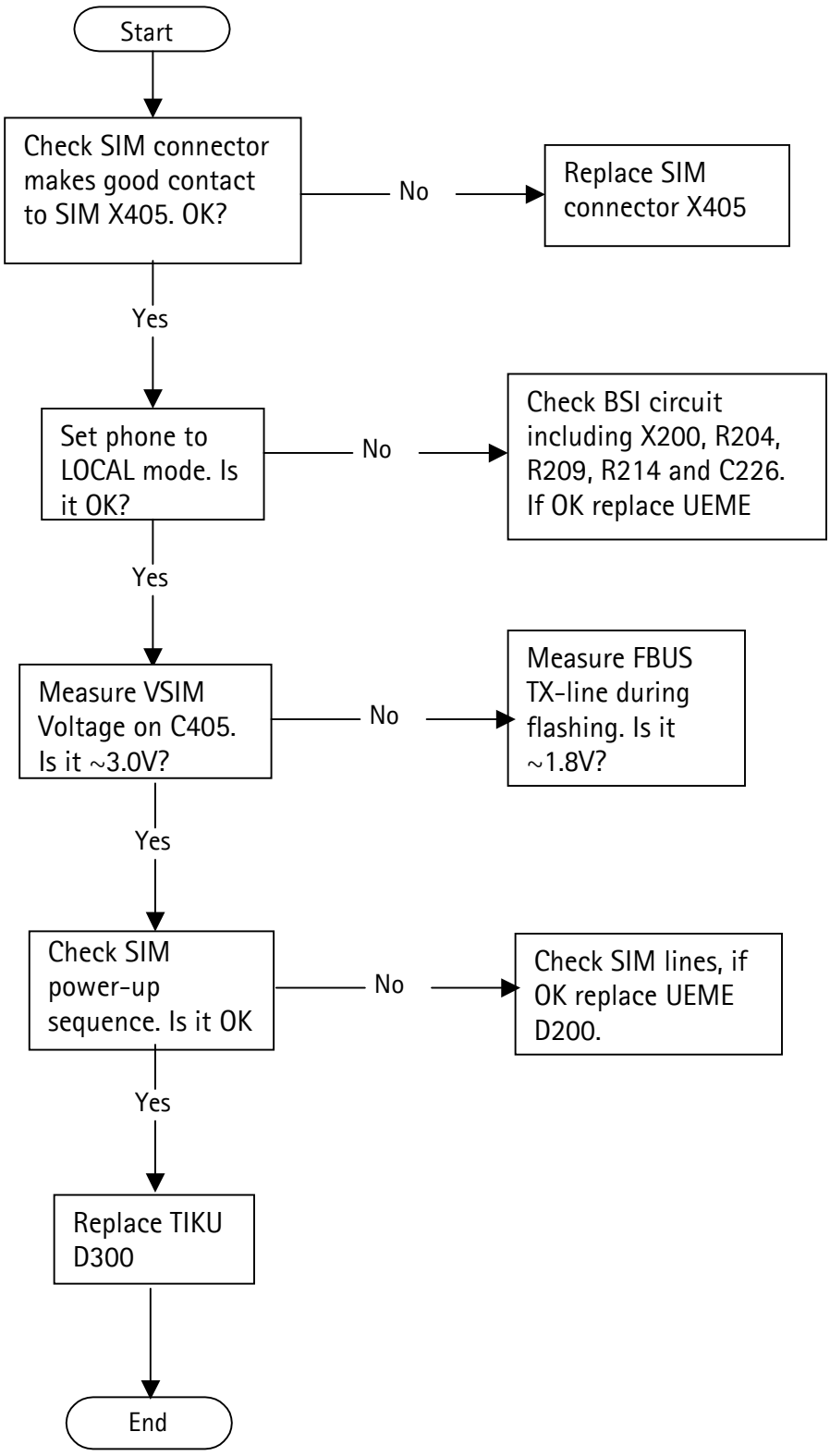
SIM Card Fault (Insert SIM / Card Rejected)


Start
Check SIM connector makes good contact to SIM X405. OK?
No
Replace SIM connector X405
Yes
Set phone to LOCAL mode. Is it OK?
No
Check BSI circuit including X200, R204, R209, R214 and C226. If OK replace UEME
Yes
Measure VSIM Voltage on C405. Is it ~3.0V?
No
Measure FBUS TX-line during flashing. Is it ~1.8V?
Yes
Check SIM power-up sequence. Is it OK
No
Check SIM lines, if OK replace UEME D200.
Yes
Replace TIKU D300
End

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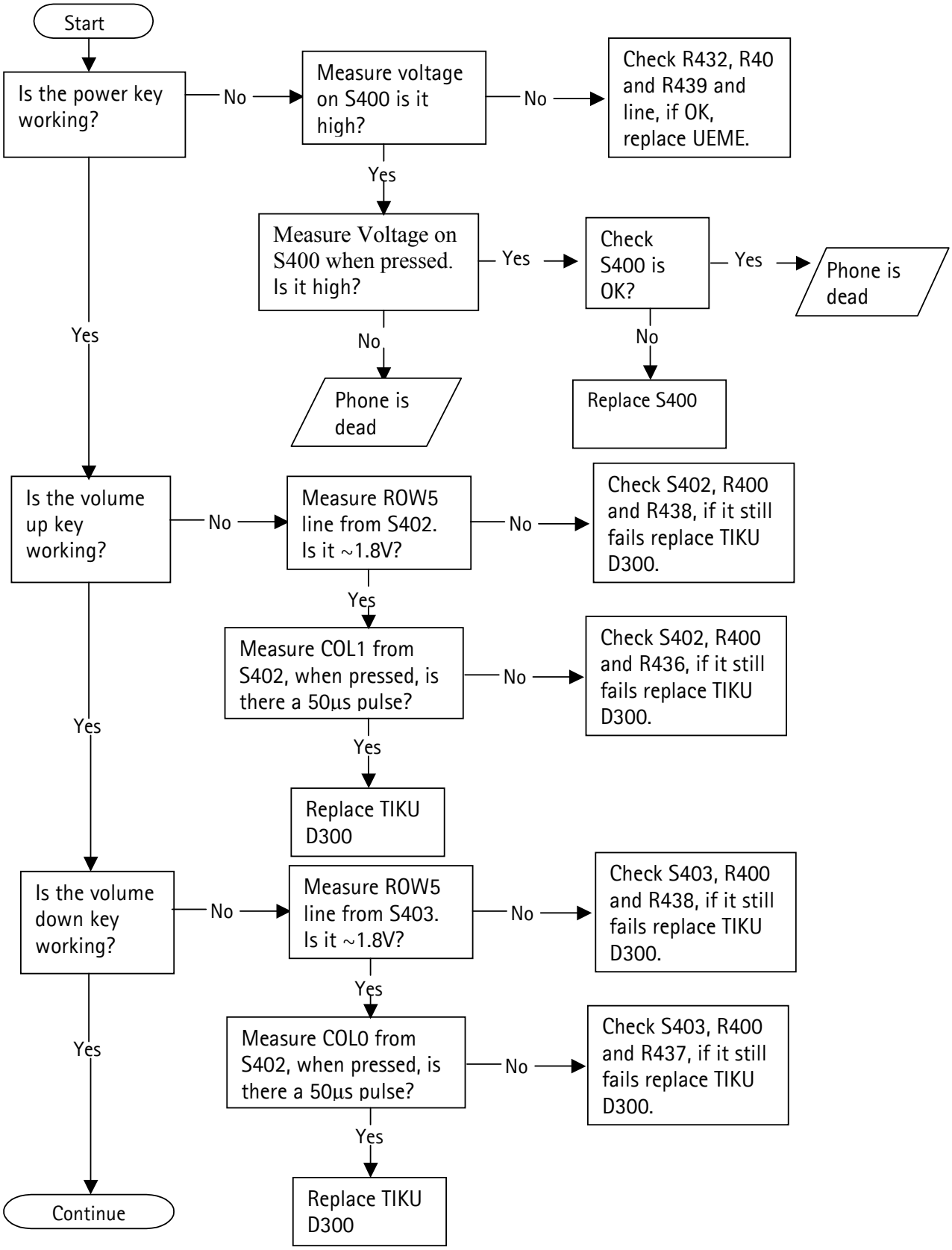
Keypad Fault


Start
Is the power key working?
No
Measure voltage on S400 is it high?
No
Check R432, R40 and R439 and line, if OK, replace UEME.
Yes
Measure Voltage on S400 when pressed. Is it high?
Yes
Check S400 is OK?
Yes
Phone is dead
No
Phone is dead
No
Replace S400
Yes
Is the volume up key working?
No
Measure ROW5 line from S402. Is it ~1.8V?
No
Check S402, R400 and R438, if it still fails replace TIKU D300.
Yes
Measure COL1 from S402, when pressed, is there a 50µs pulse?
No
Check S402, R400 and R436, if it still fails replace TIKU D300.
Yes
Replace TIKU D300
Yes
Is the volume down key working?
No
Measure ROW5 line from S403. Is it ~1.8V?
No
Check S403, R400 and R438, if it still fails replace TIKU D300.
Yes
Measure COL0 from S402, when pressed, is there a 50µs pulse?
No
Check S403, R400 and R437, if it still fails replace TIKU D300.
Yes
Replace TIKU D300
Yes
Continue

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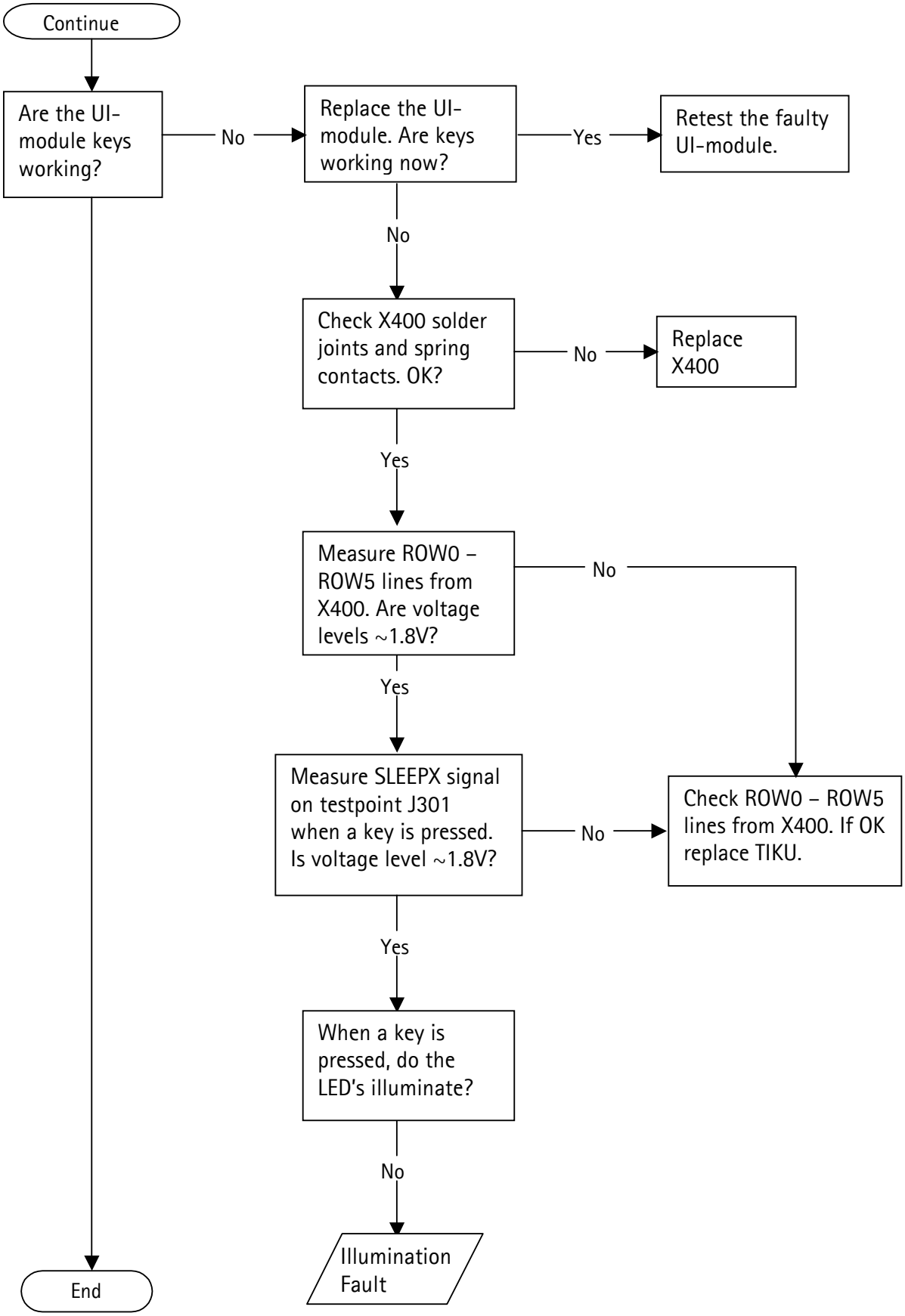

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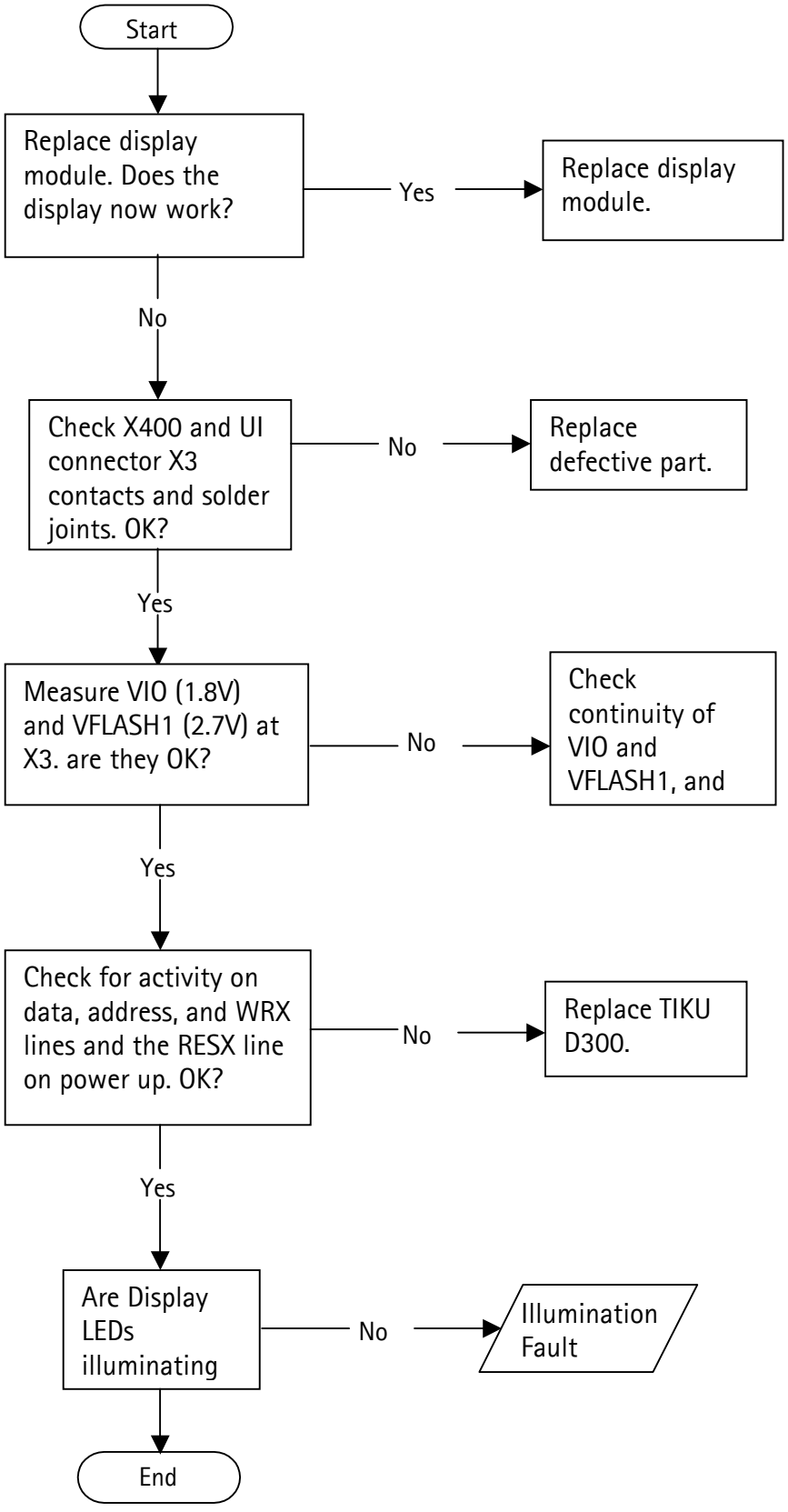
Display Fault



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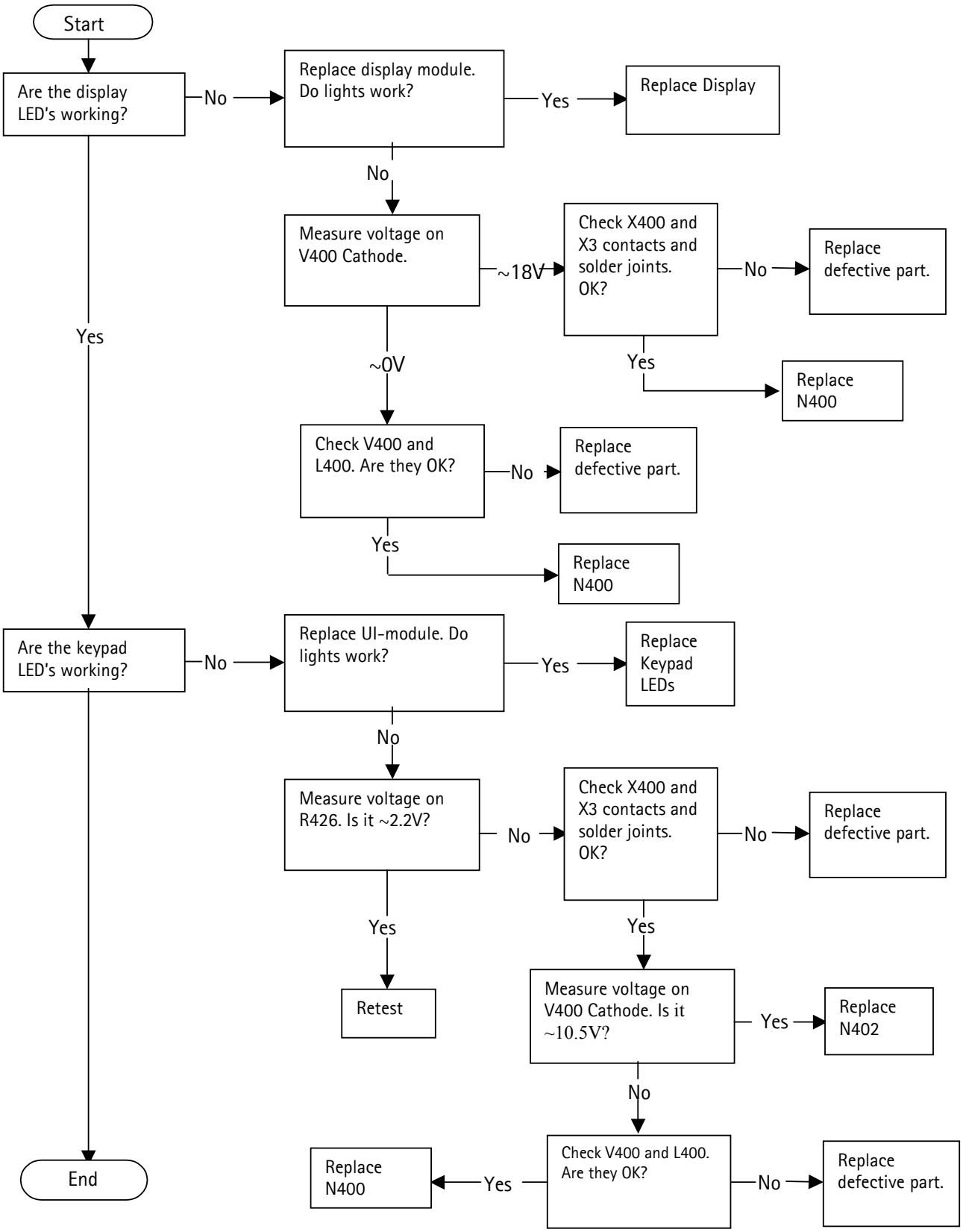
Illumination Fault



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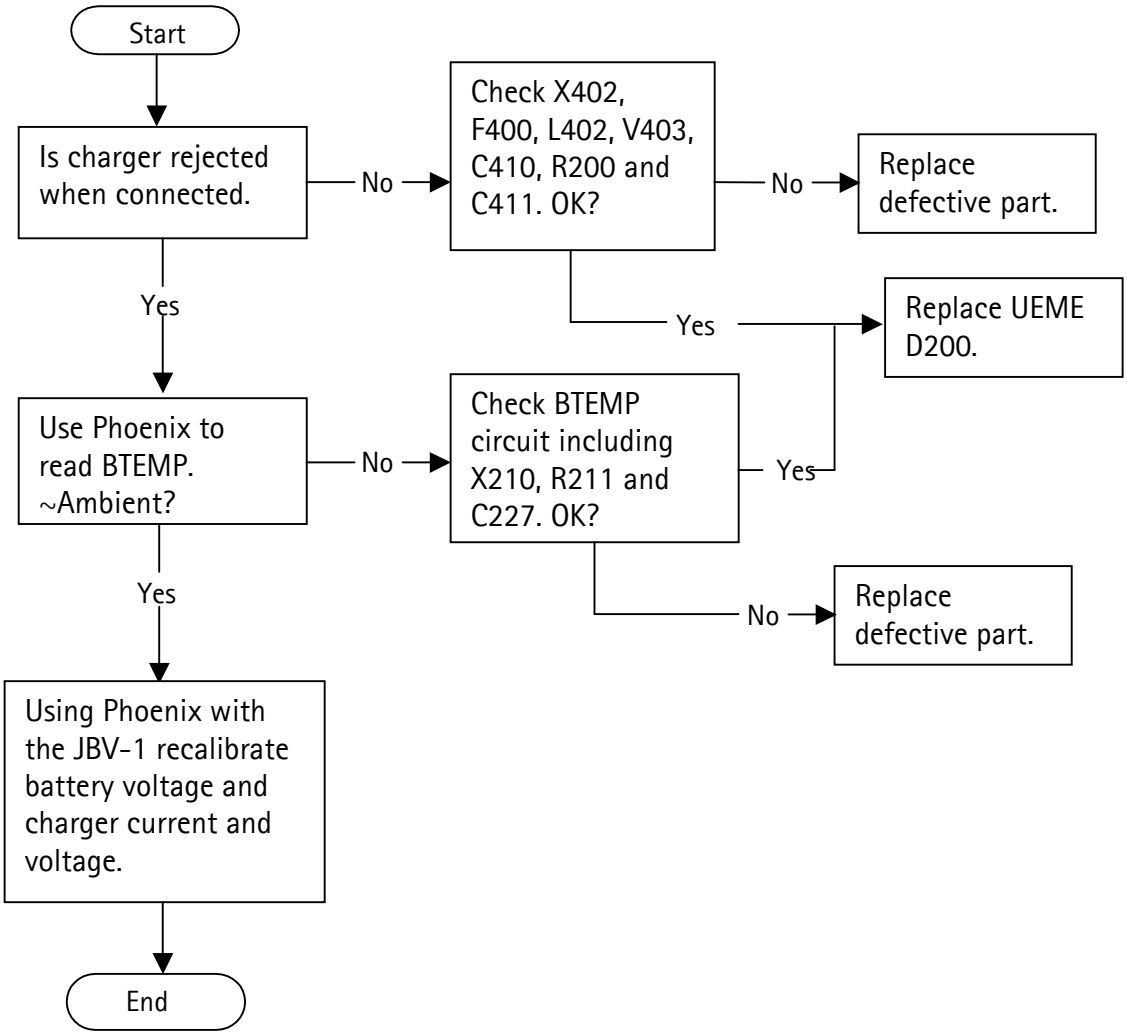
Charger Fault



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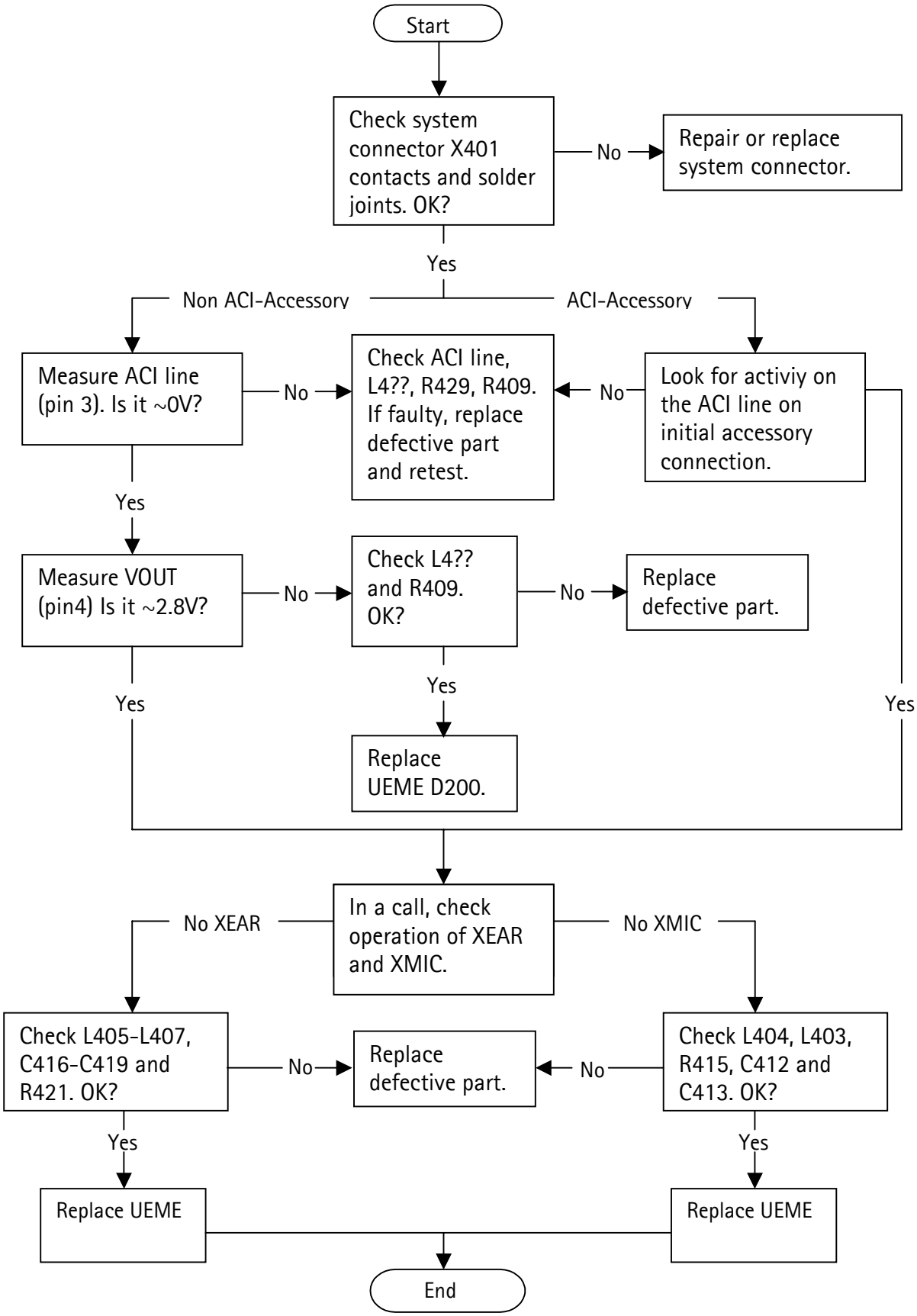
Accessory Fault



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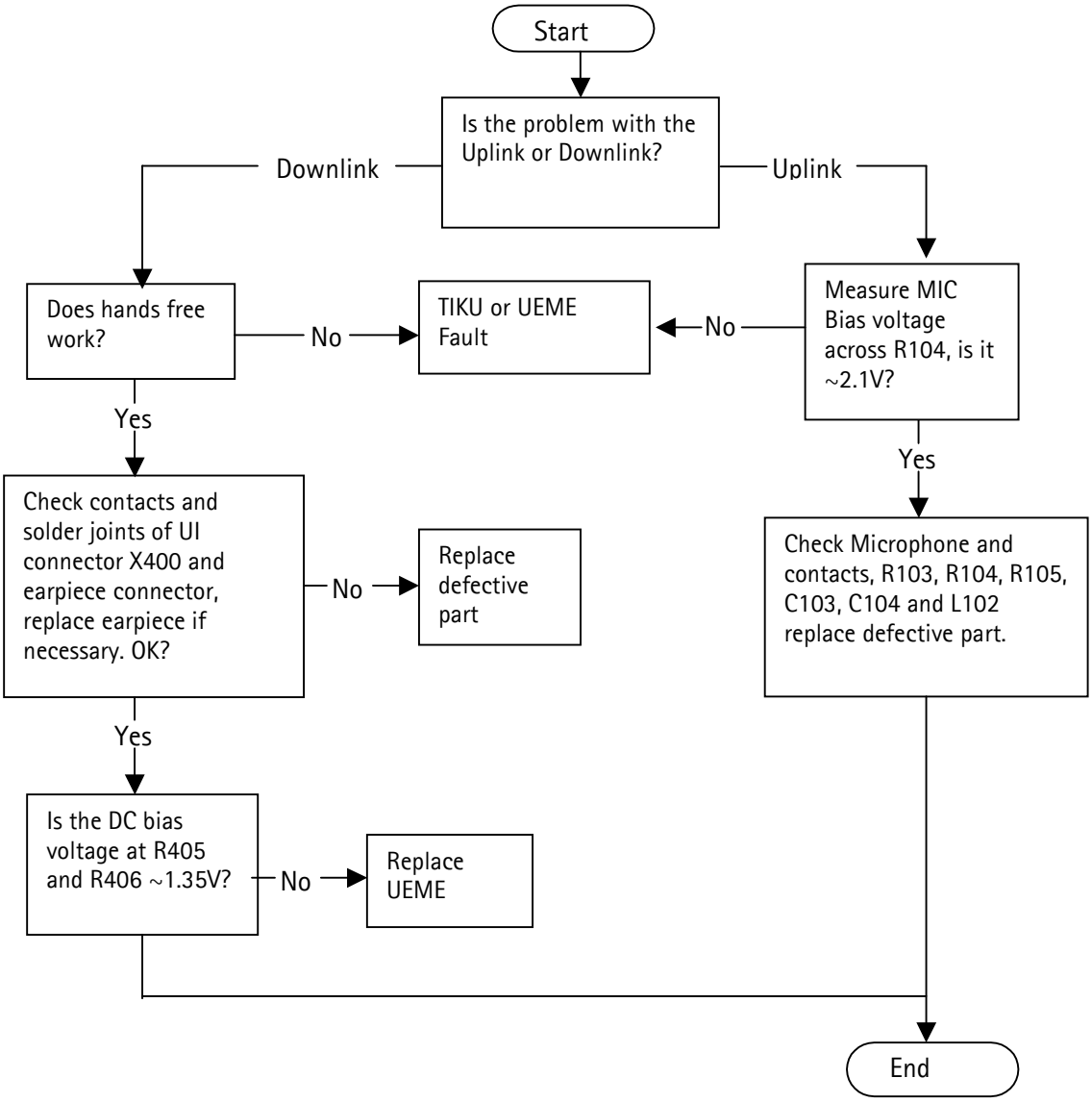
Audio Fault


Start
Is the problem with the Uplink or Downlink?
Downlink
Uplink
Does hands free work?
No
TIKU or UEME Fault
No
Measure MIC Bias voltage across R104, is it ~2.1V?
Yes
Yes
Check contacts and solder joints of UI connector X400 and earpiece connector, replace earpiece if necessary. OK?
No
Replace defective part
Check Microphone and contacts, R103, R104, R105, C103, C104 and L102 replace defective part.
Yes
Is the DC bias voltage at R405 and R406 ~1.35V?
No
Replace UEME
End

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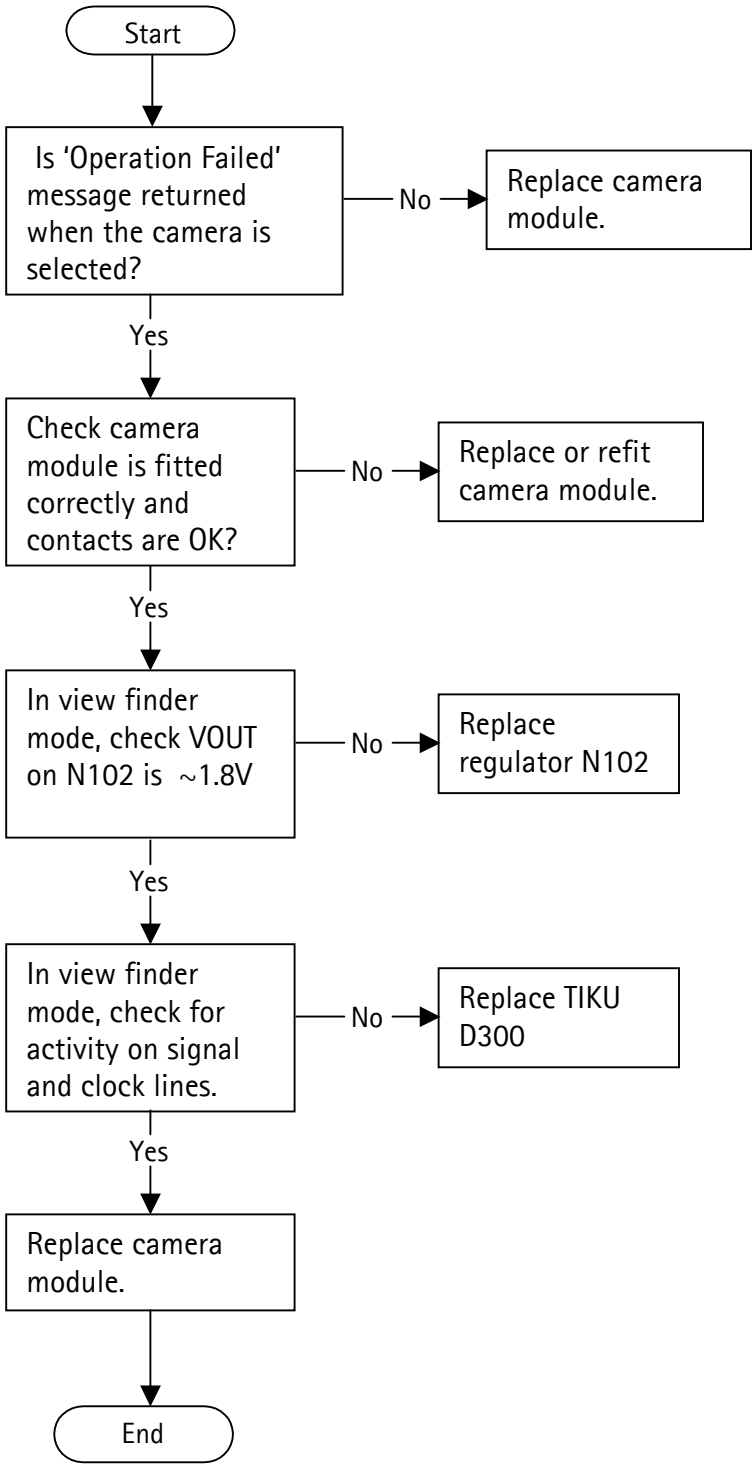
Camera Fault



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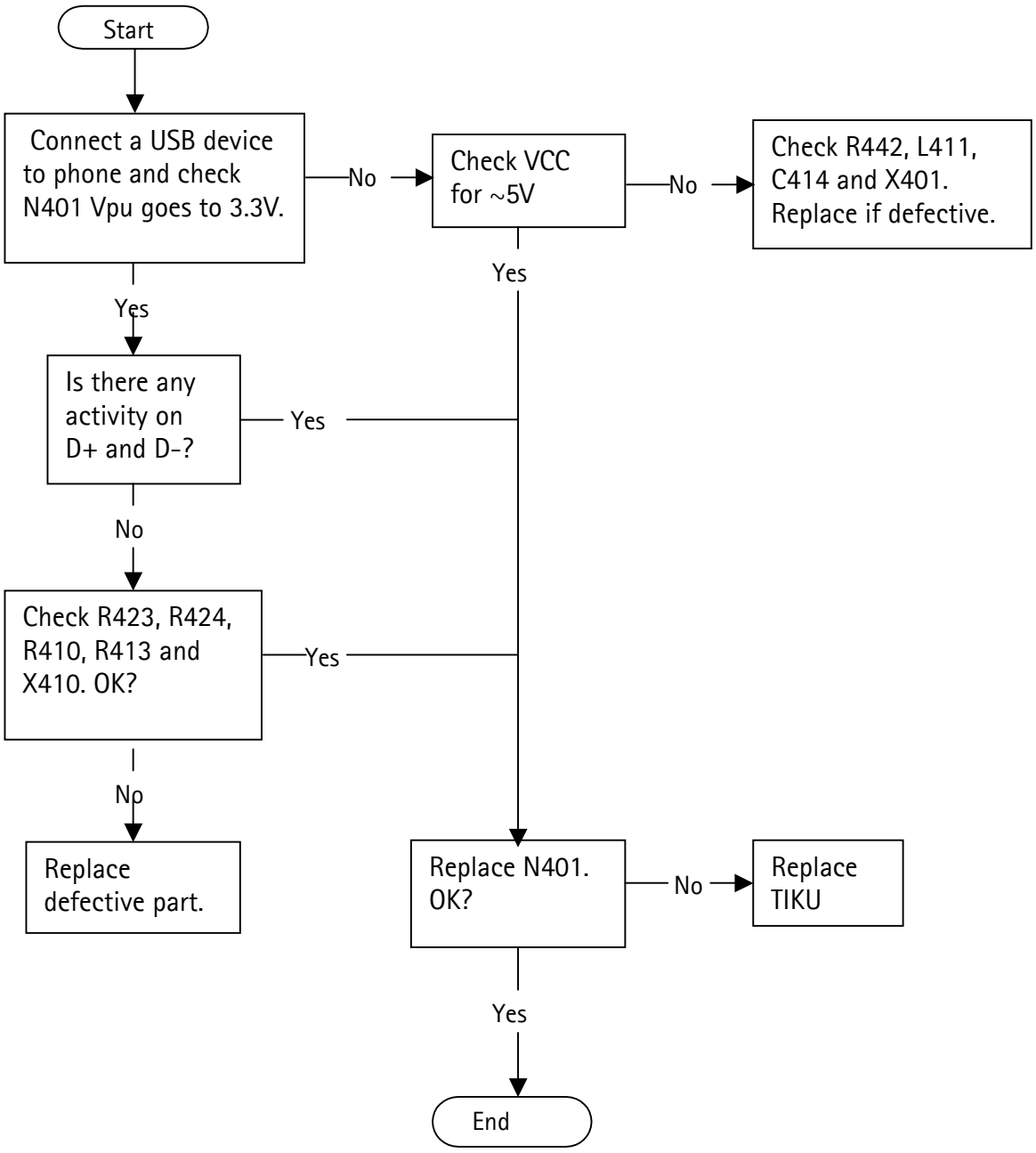
USB Fault



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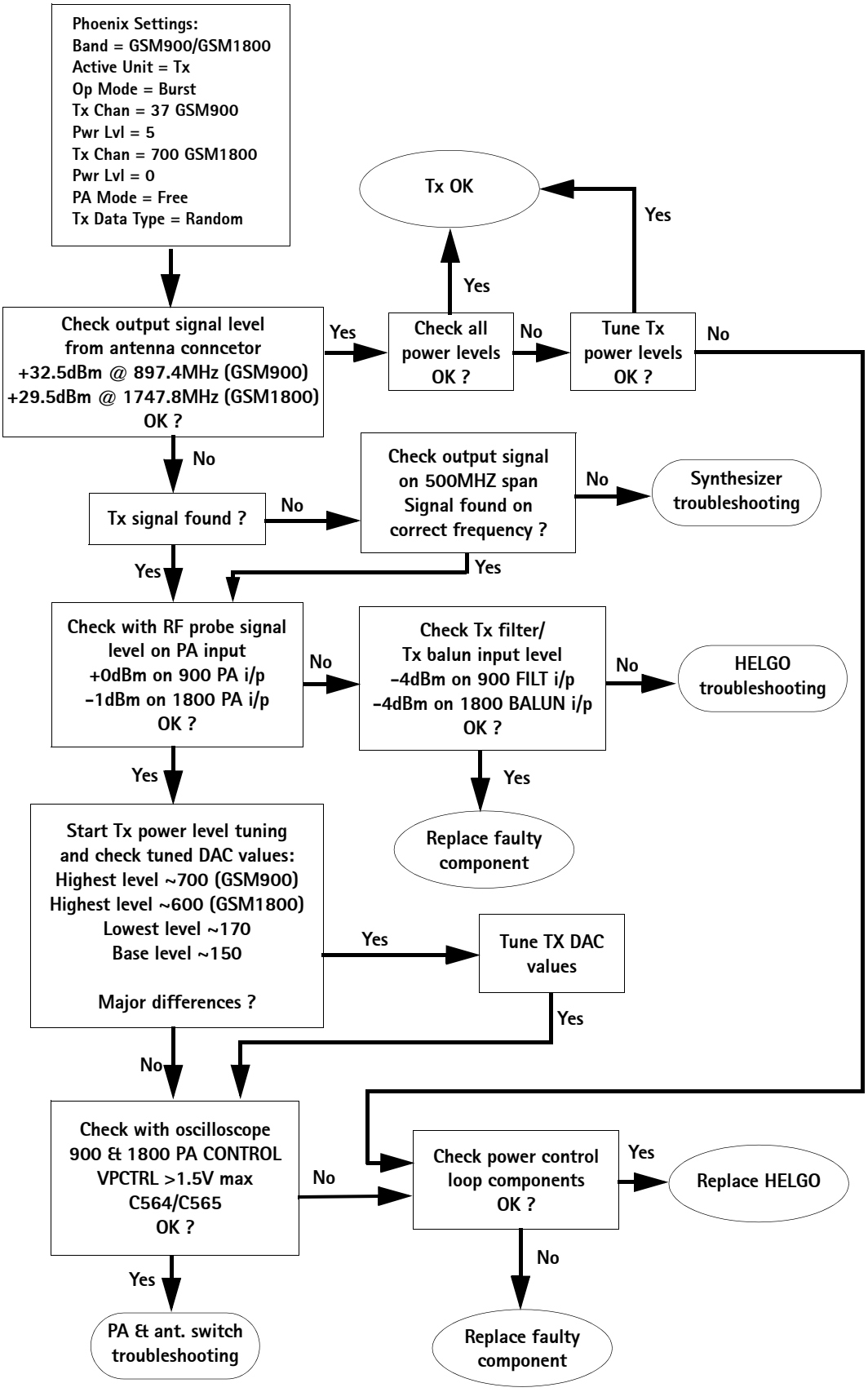
GSM900/1800 TX Troubleshooting


Phoenix Settings:
Band = GSM900/GSM1800
Active Unit = Tx
Op Mode = Burst
Tx Chan = 37 GSM900
Pwr Lvl = 5
Tx Chan = 700 GSM1800
Pwr Lvl = 0
PA Mode = Free
Tx Data Type = Random
Tx OK
Yes
Yes
Check output signal level from antenna conncetor +32.5dBm @ 897.4MHz (GSM900) +29.5dBm @ 1747.8MHz (GSM1800) OK ?
Yes
Check all power levels OK ?
No
Tune Tx power levels OK ?
No
No
Check output signal on 500MHZ span Signal found on correct frequency ?
No
Synthesizer troubleshooting
Tx signal found ?
No
Yes
Yes
Check with RF probe signal level on PA input +0dBm on 900 PA i/p -1dBm on 1800 PA i/p OK ?
No
Check Tx filter/ Tx balun input level -4dBm on 900 FILT i/p -4dBm on 1800 BALUN i/p OK ?
No
HELGO troubleshooting
Yes
Yes
Replace faulty component
Start Tx power level tuning and check tuned DAC values: Highest level ~700 (GSM900) Highest level ~600 (GSM1800) Lowest level ~170 Base level ~150 Major differences ?
Yes
Tune TX DAC values
Yes
No
Check with oscilloscope 900 & 1800 PA CONTROL VPCTRL >1.5V max C564/C565 OK ?
No
Check power control loop components OK ?
Yes
Replace HELGO
No
Yes
PA & ant. switch troubleshooting
Replace faulty component

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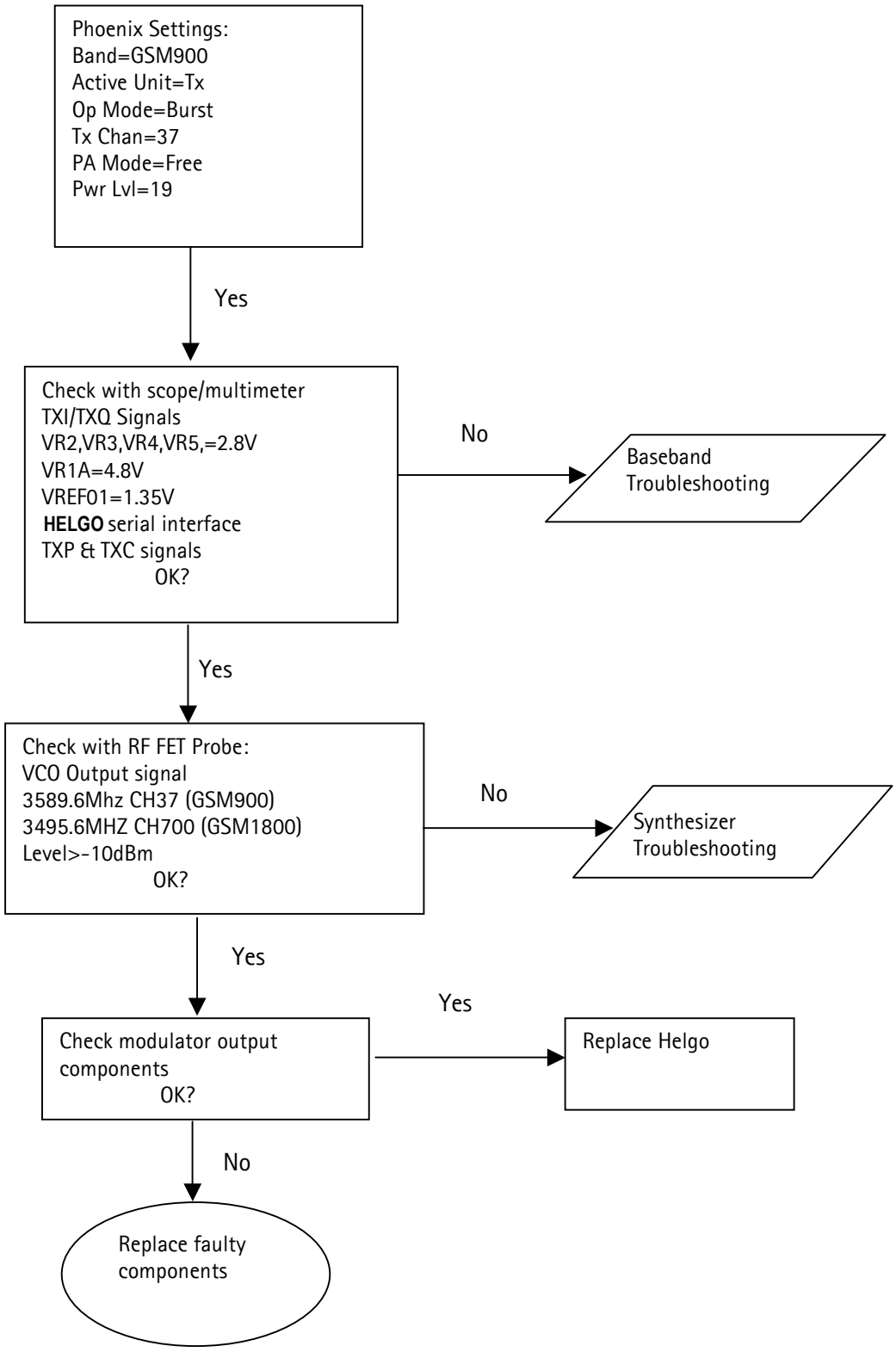
HELGO Troubleshooting



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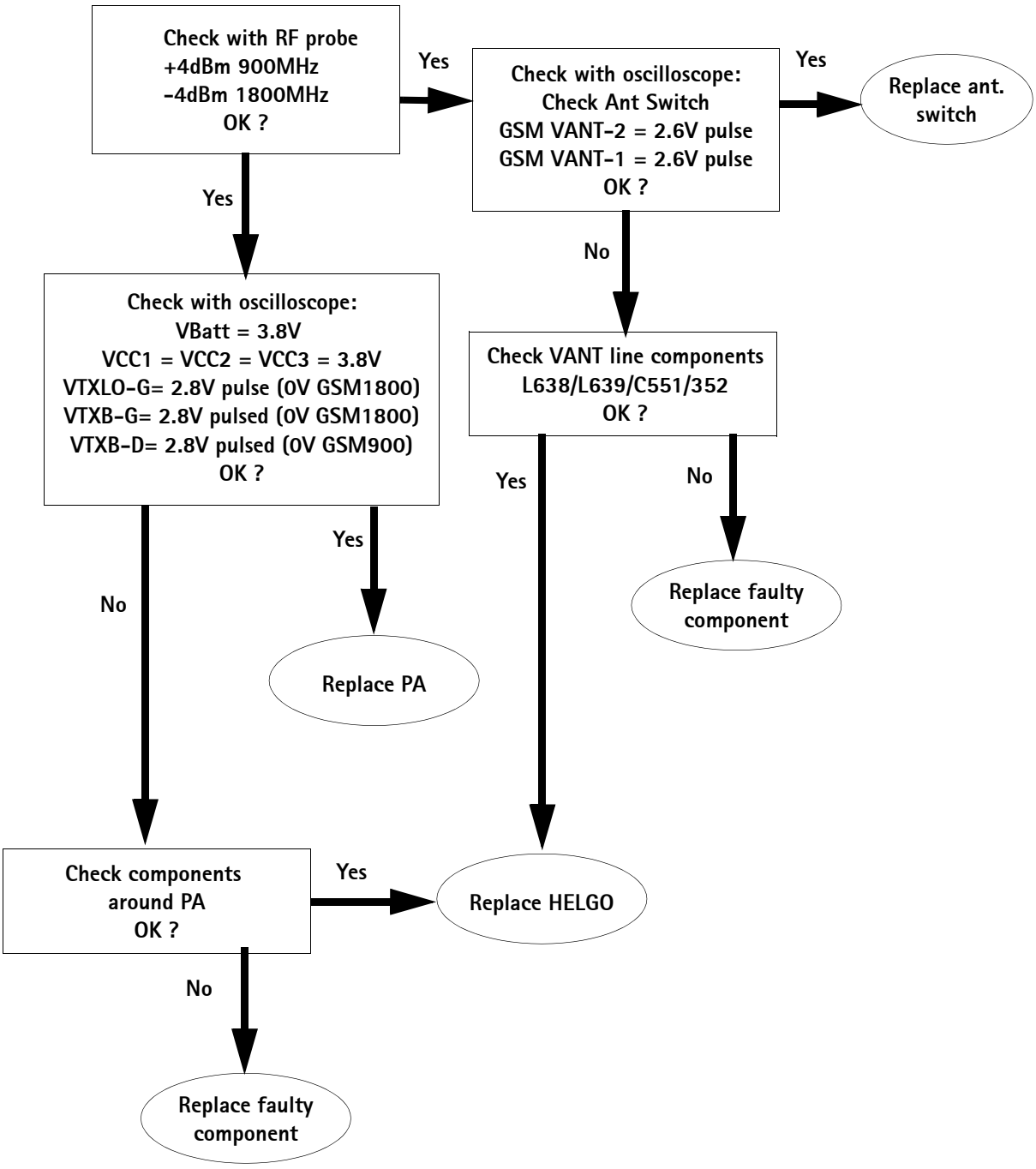
PA and Antenna Switch Troubleshooting



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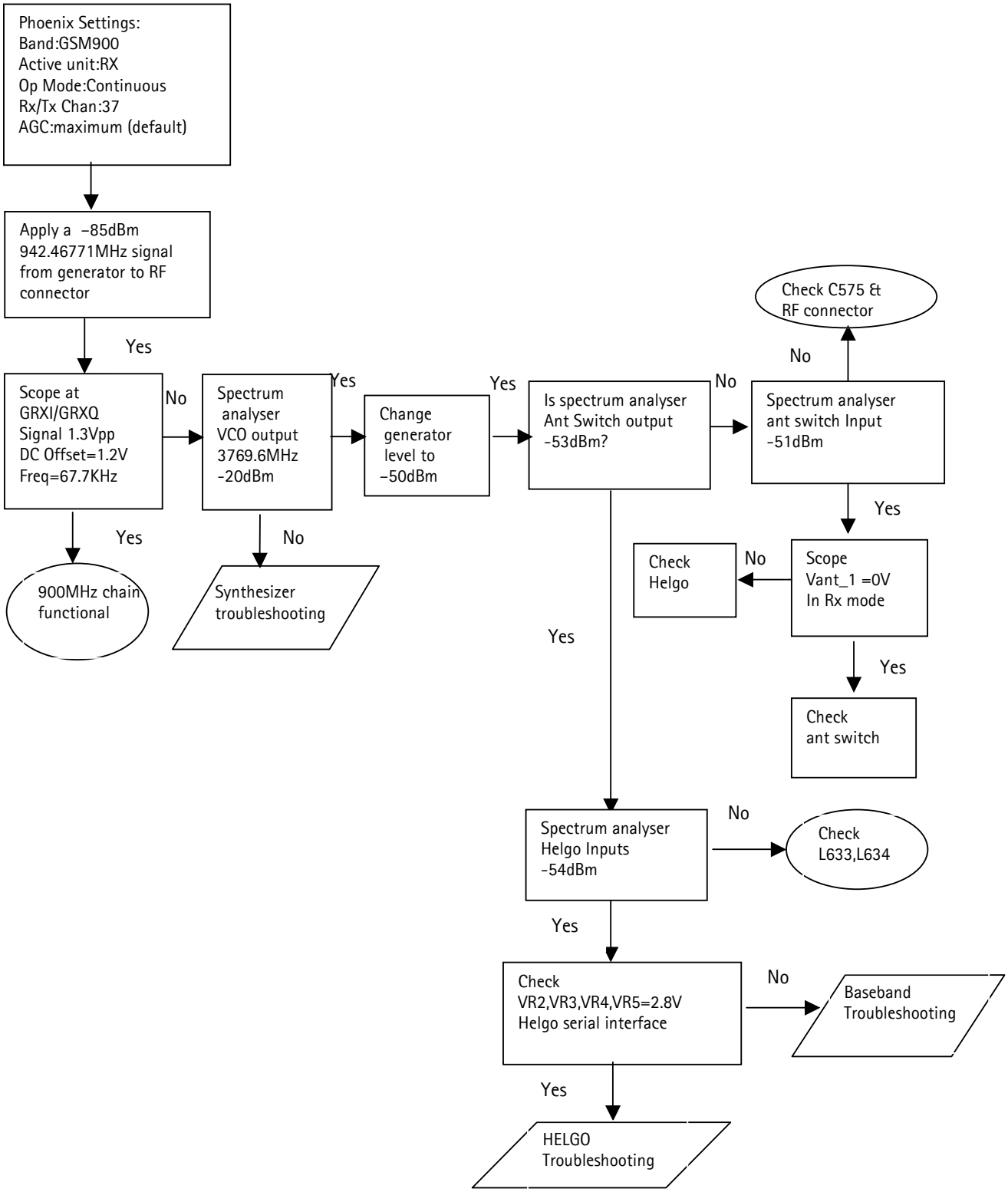
GSM900 RX Troubleshooting



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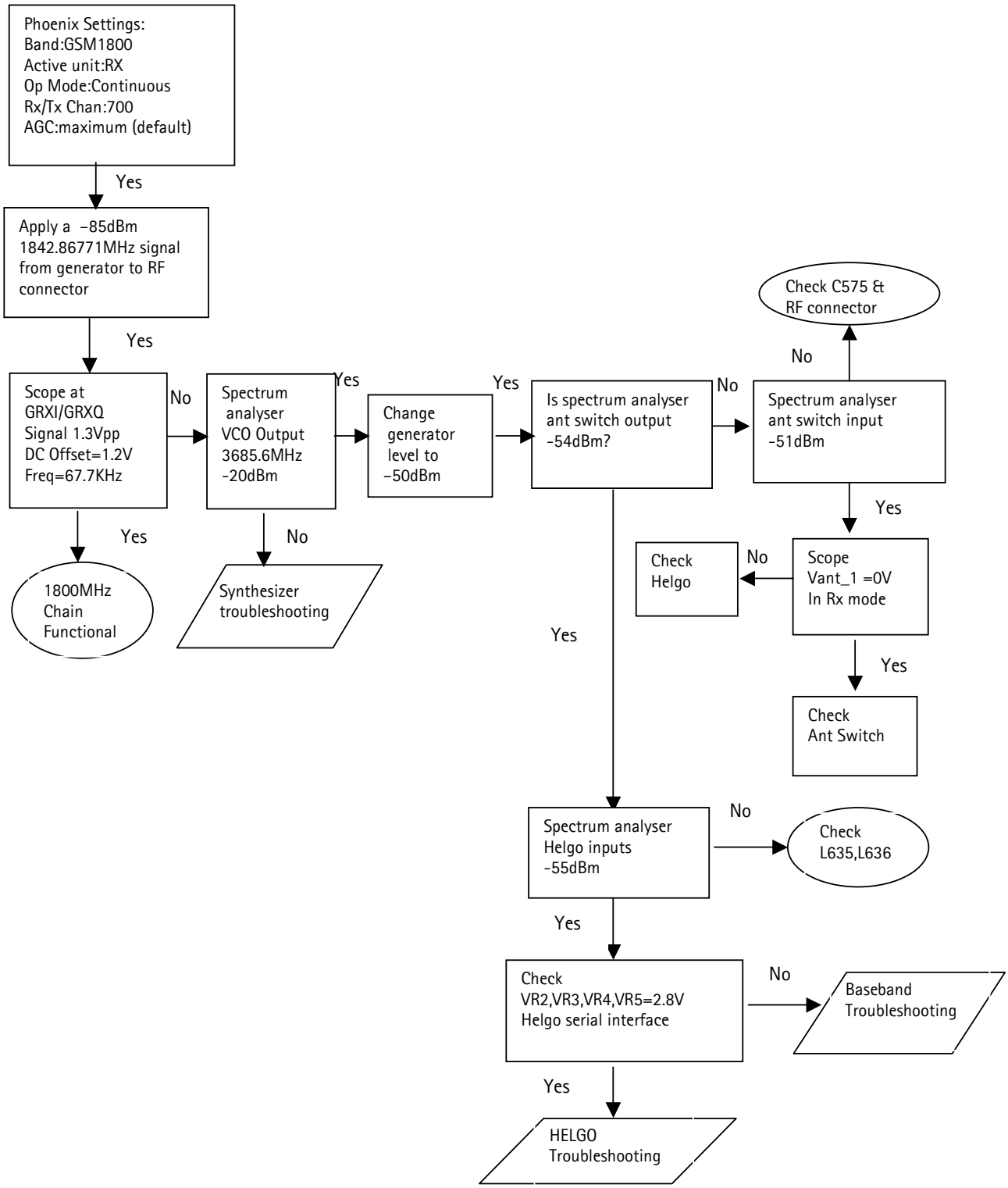
GSM1800 RX Troubleshooting



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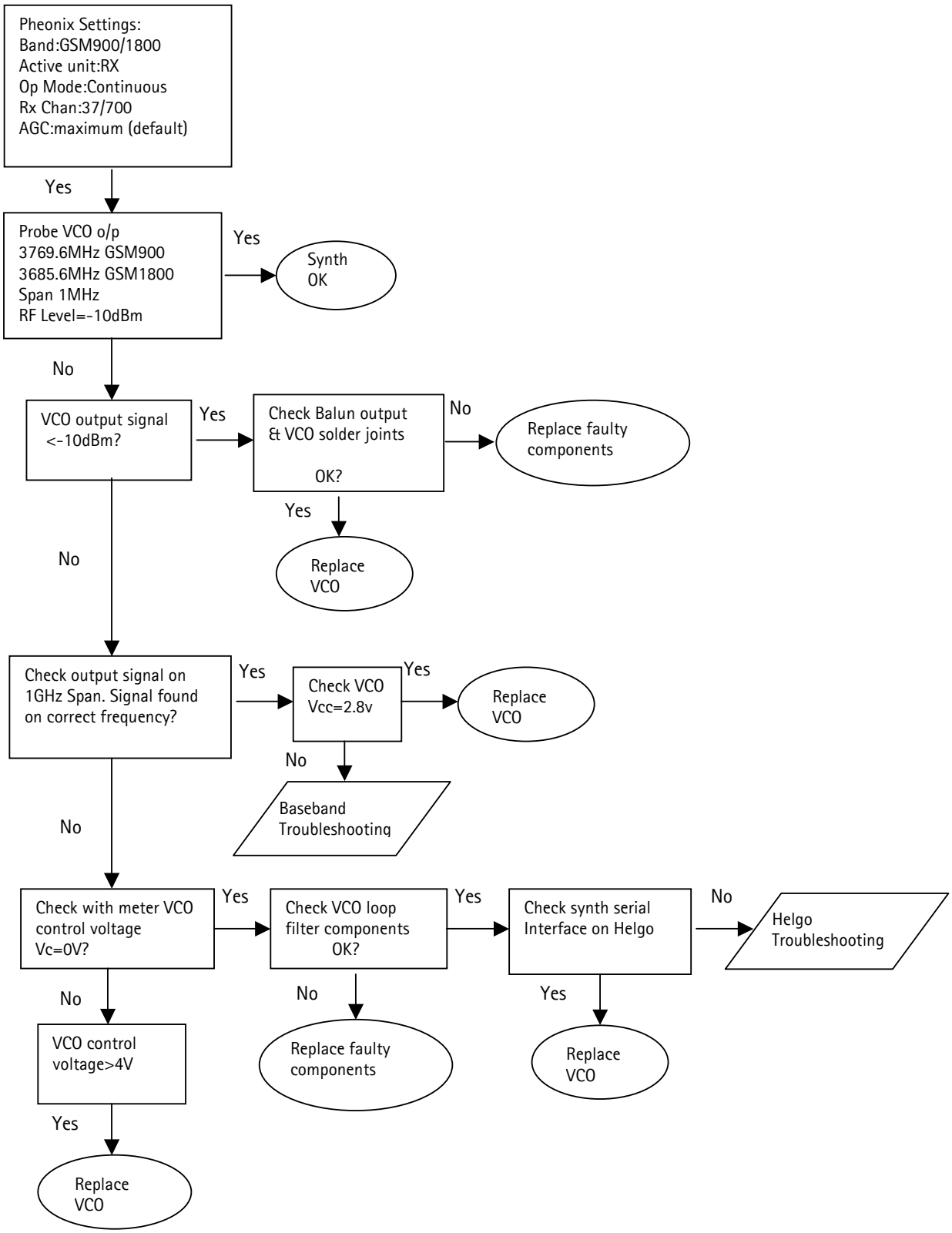
GSM900/1800 Synthesizer Troubleshooting



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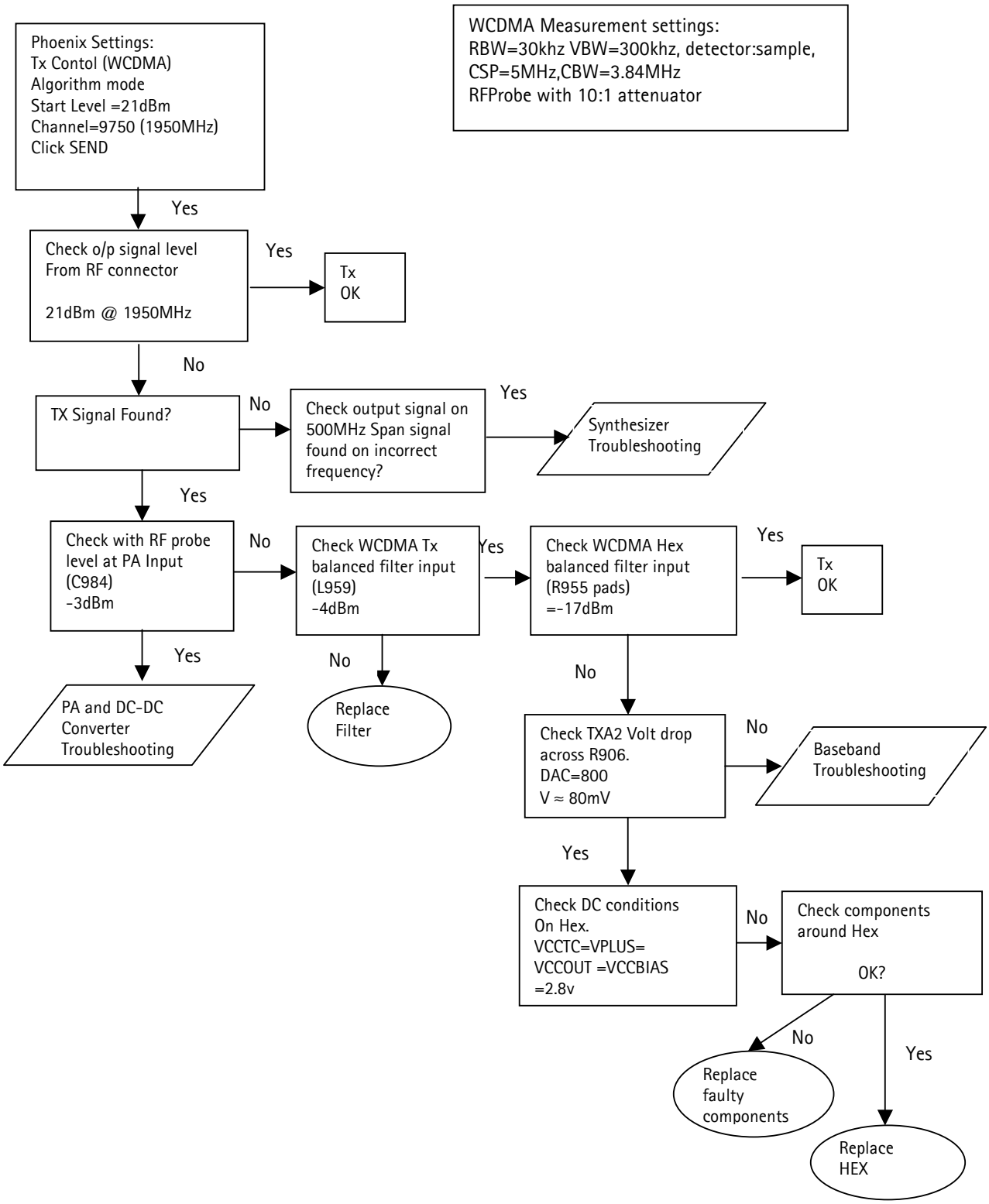
WCDMA Tx Troubleshooting



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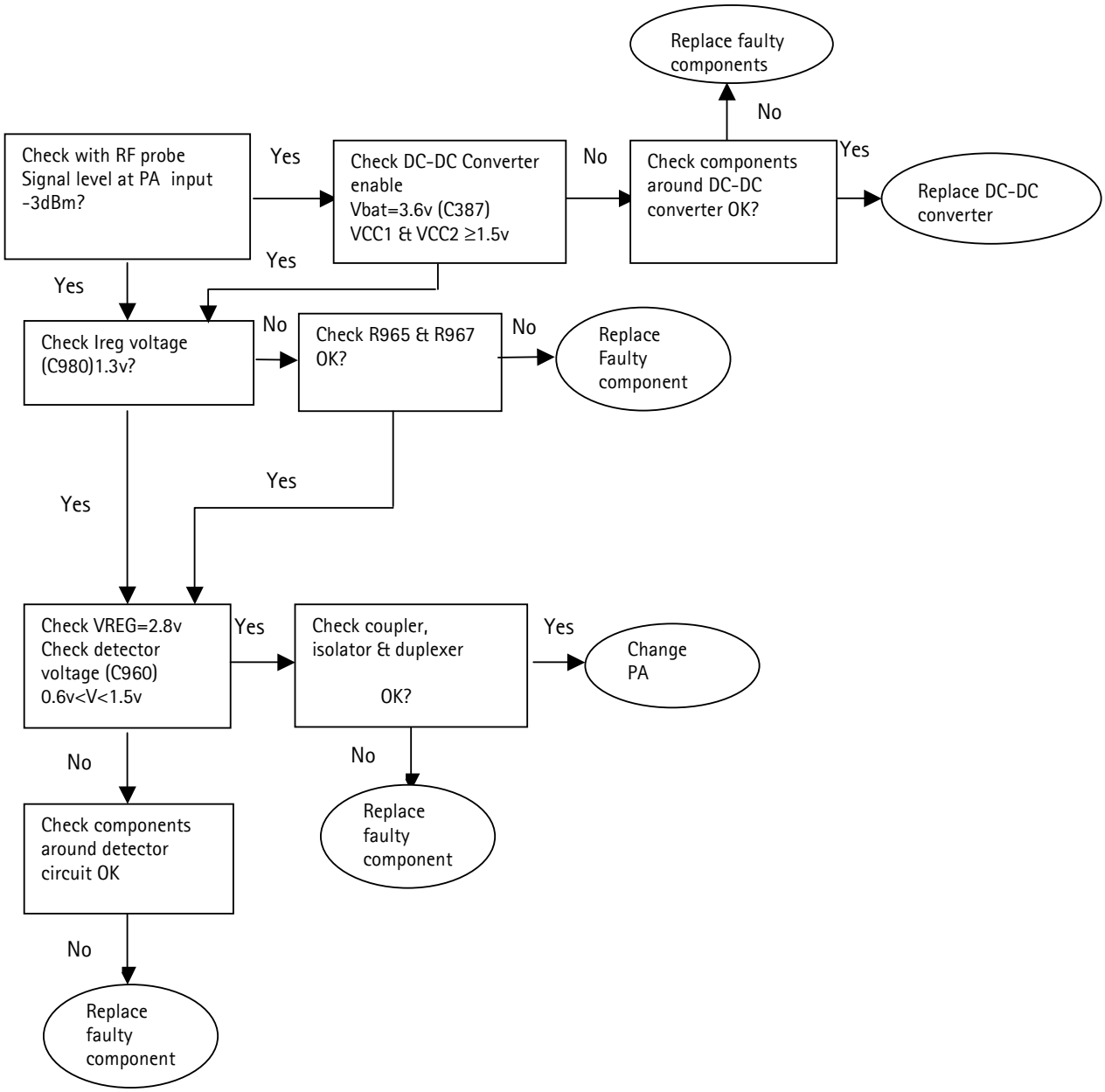
PA and DC-DC Converter Troubleshooting



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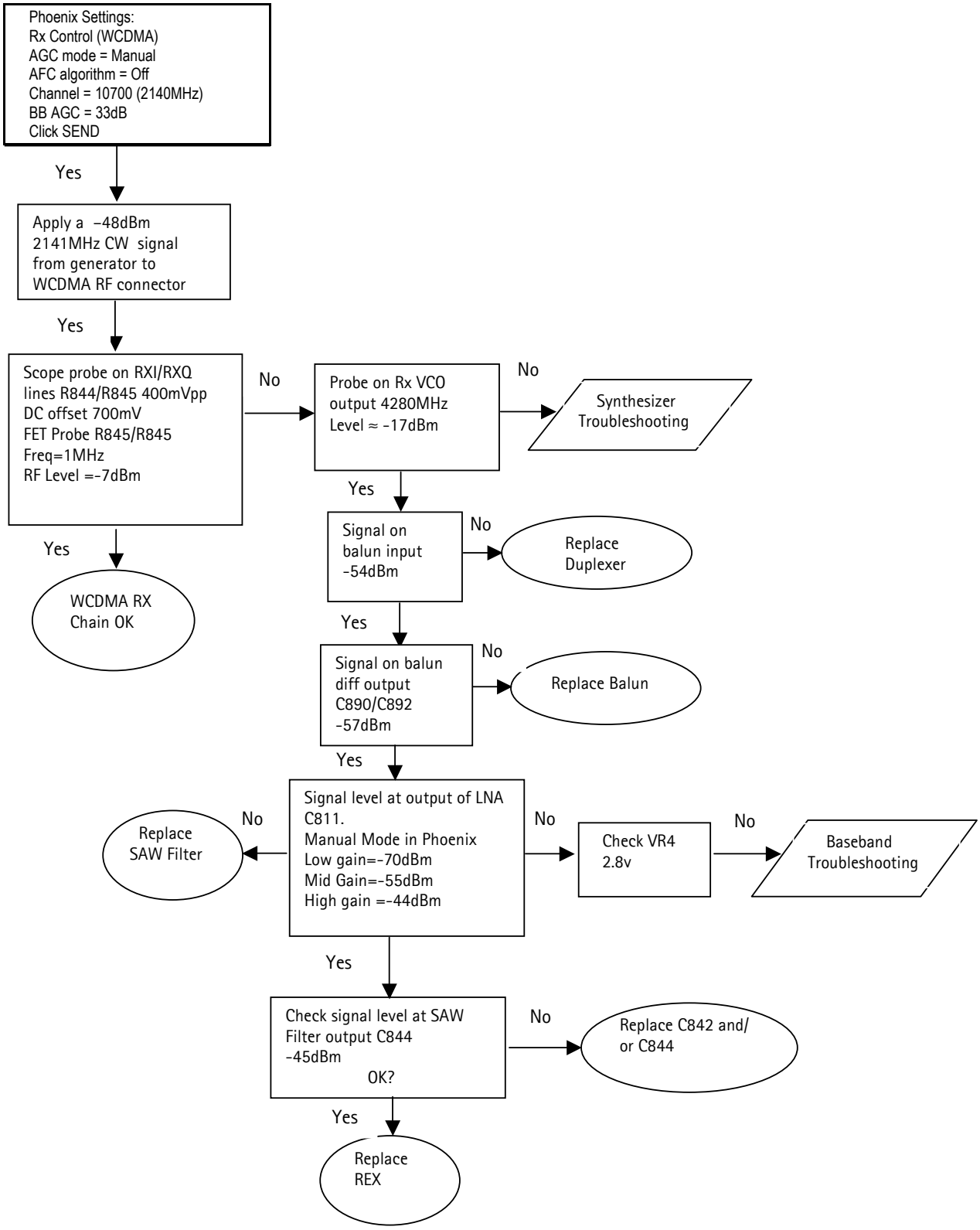
WCDMA Rx Troubleshooting



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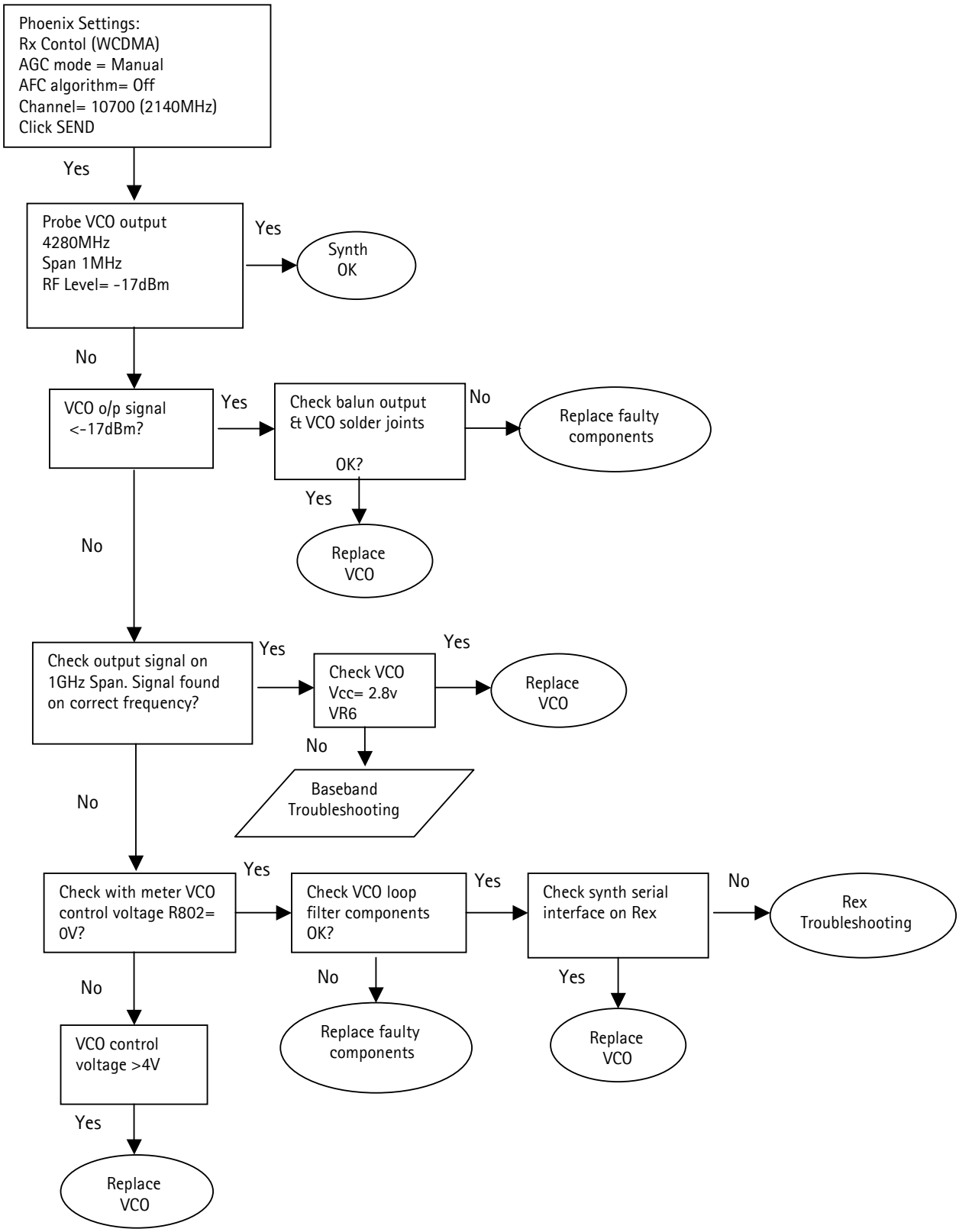
WCDMA Rx Synthesizer Troubleshooting



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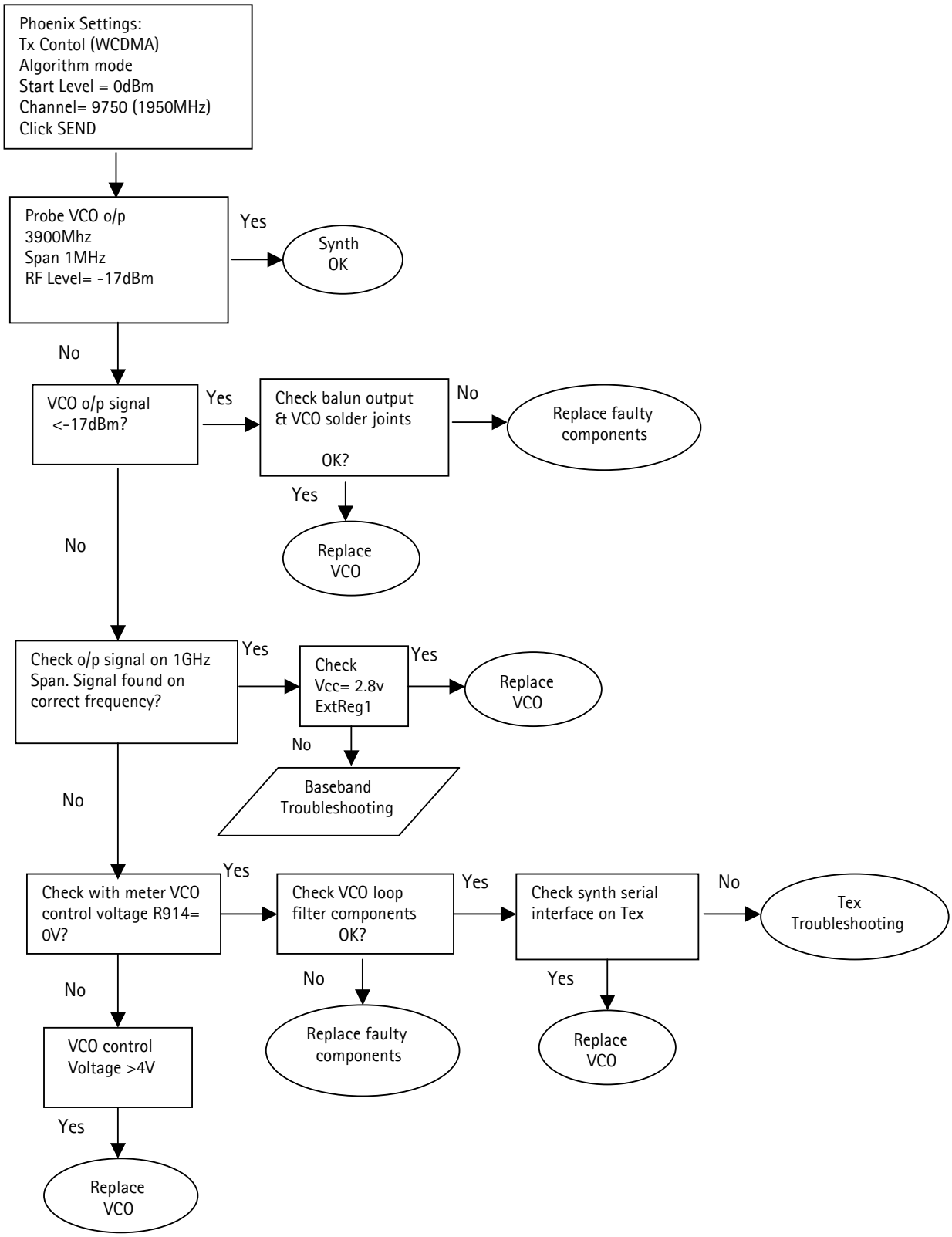
WCDMA Tx Synthesizer Troubleshooting



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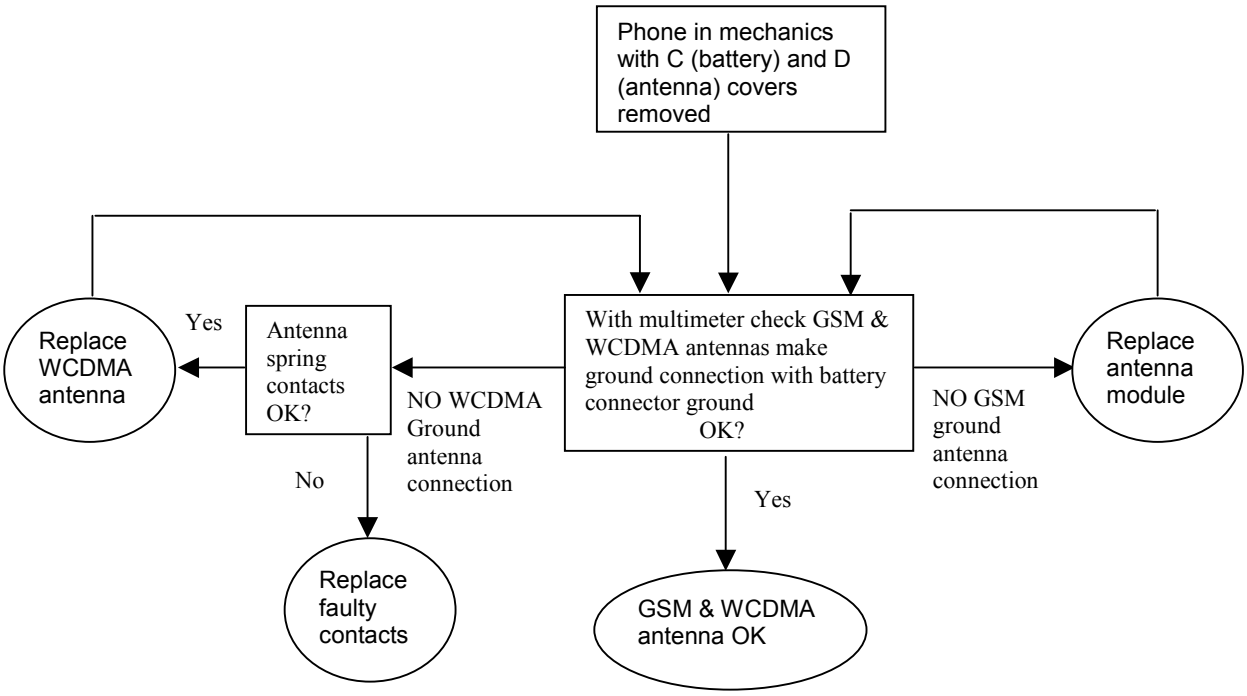
GSM/WCDMA Antenna Troubleshooting


Phone in mechanics with C (battery) and D (antenna) covers removed
With multimeter check GSM & WCDMA antennas make ground connection with battery connector ground OK?
Yes
Antenna spring contacts OK?
Replace WCDMA antenna
NO WCDMA Ground antenna connection
No
Replace faulty contacts
NO GSM ground antenna connection
Replace antenna module
Yes
GSM & WCDMA antenna OK

Test Points

Signal	Ref	Test point	Function	Characteristic	Note
PURX	100	N101 Pin 44	External reset	1.8V Active Low	From UEME
SLEEPX	101	J101	Sleep mode control signal	1.8V Active mode 0V Sleep mode	
SLEEPCLK	102	N101 Pin 26	Sleep Clock	32.768KHz digital clock 1.8V	
UEMRSTX	103	N101 Pin 49	UEME Reset	Vbat	
SYSCLK	104	N101 Pin 50	Bluetooth system Clock	26MHz	
CBUSCLK	105	N101 Pin 36	Serial control bus clock	1MHz digital clock signal 1.8V	TIKU peripheral control bus
CBUSDA	106	N101 Pin 35	Serial control bus data bi-directional	1.8V digital signal	bi-directional
CBUSENX	107	N101 Pin 34	CBUS enable signal	1.8V digital signal	
MICBI	108	R103	Microphone bias voltage	2.1V	
MIC1P	109	C103	Microphone positive	~1.35V dc + signal	
MIC!N	110	C104	Microphone negative	~1.35V dc	
Internal Mic	111	L12	Microphone out	1V - 2V + signal	Depending on microphone
LEDA	112	R106	Anode supply for Infrared	Vbat IR Off ~Vbat - 1.6V IR on digital signal	
TXD	113	V100 Pin 3	Infrared Tx data	1.8V digital signal	
RXD	114	V100 Pin 4	Infrared Rx data	1.8V digital signal	
VOUT	115	C109	Camera supply	2.8V	
CAMSWITCH	116	R110	Camera switch	1.8V	
FBUSRX	400	J400 Pin 3	Flash programming data and phone control	2.78V digital signal	From FPS-8 / PC to phone

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Signal	Ref	Test point	Function	Characteristic	Note
FBUSTX	401	J400 Pin 2	Flash programming data and phone control	2.78V digital signal	From phone to FPS-8 / PC
MBUS	402	J400 Pin 7	Flash programming clock	2.78V digital signal 6.5 MHz max	
COL2	403	R435	Key pad column	1.8V digital signal	
COL1	404	R436	Key pad column	1.8V digital signal	
COL0	405	R437	Key pad column	1.8V digital signal	
ROW5	406	R438	Key pad row	1.8V digital signal	
+VLCDLED	407	V400 Cathode	Supply for Key and LCD LEDs	~10.5V	18V max open circuit
-VLCLED	408	R408	LCD LED current sense	~0.5V	
KLIGHT	409	N402 Pin 2	Key LED control signal	Vbat Active low	
DLIGHT	410	N400 Pin 8	Display LED control signal	Vbat Active high	
1KEYLED	411	R426	Key light current sense resistor	~1.9V	
SIMDATA	412	X403 Pin 6	SIM data	1.8V / 3V digital signal	From UEME to SIM card
SIMCLK	413	X403 Pin 1	SIM Clock	1.8V / 3V digital signal	From UEME to SIM card
SIMRST	414	X403 Pin 2	SIM Reset	1.8V / 3V digital signal	From UEME to SIM card
HOOKINT	415	J407	Accessory off hook interrupt signal	2.8V no accessory 1.8V accessory connected 1.1V button pressed	
ACI	416	C425	Accessory detection and digital communications bus	2.78V digital sinal	Bidirectional data
VBUS	417	C422	USB external supply in from host	~5.0V	
Vreg	418	C414	USB IO supply	3.3V	
D+	419	C421	USB data	3.3V digital signal 12MHz	
D-	420	C424	USB data	3.3V digital signal 12MHz	
XMICN	421	L404	External microphone negative	0V no accessory connected	Value with accessory connected varies with accessory type.
XMICP	422	L403	External microphone positive	2.1V no accessory connected	Value with accessory connected varies with accessory type.
XEARN	423	L405	External ear negative left / mono	1.35V dc - signal	
XEARP	424	L406	External ear positive left / mono	1.35V dc + signal	
XEARNR	425	L407	External ear negative right	1.35V dc - signal	
XEARPR	426	L408	External ear positive right	1.35V dc + signal	
VCHAR	427	V403 Cathode	Charger voltage	~4.2V charging ~8.0V charge switch open	When: Ibat = 500mA Vbat = 3.8V
CLK	450	J450	SDRAM Clock	1.8V digital signal	
FlsCLK	451	J451	Flash Clock	1.8V digital signal	
VOUT	452	C451	SDRAM Supply voltage	2.85V	
VPP	453	C453	Flash programming voltage	1.8V Internal 12V External	FPS-8 external VPP source
OUT	300	C301	COWIS regulator out	1.8V	
RFCKOCK	301	C300	Reference Clock	19.2MHz	

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Signal	Ref	Test point	Function	Characteristic	Note
FBUSRXI	302	J313	Flash programming data and phone control	1.8V digital signal	From UEME to TIKU
FBUSTXI	303	J314	Flash programming data and phone control	1.8V digital signal	From TYIKU to UEME
MBUSRX	304	J315	Flash programming clock	1.8V digital signal	From UEME to TIKU
MBUSTX	305	J316	ACI data bus between UEME and TIKU	1.8V digital signal	Bi-directional
OSCIN	200	C211	Real Time Clock crystal in	32.768KHz	
OSCOUT	201	C210	Real Time Clock crystal out	32.768KHz	
VBAT	202	J202	Battery voltage	3.2V - 4.2V	
BSI	203	J203	Battery size indicator Local mode indicator SIM removal Indicator Flash programming start signal	1.2V in normal mode 0.09V in local mode If BSI line rises >2.1V, 2.78V BSI pulse	To UEME A/D converter
BTEMP	204	R211	Battery temperature indicator	~0.9V at 25°C	
VTIKU	205	C203	TIKU core supply voltage	1.5V	
VANA	206	C208	UEME internal analog supply	2.78V	
VFLASH1	207	C208	LDO regulator	2.78V	
VAUX2	208	C207	Accessory supply	2.78V	
VCORE	209	C207	Camera digital supply	1.8V	
VIO	210	C206	I/O supply	1.8V	
VSIM	211	C206	Programmable SIM card supply	1.8V or 3.0V	Voltage determind by SIM type
PAOUTP	212	R227	Handsfree speaker positive	Vbat/2 + signal	When active
PAOUTN	213	R228	Handsfree speaker negative	Vbat/2 - signal	When active
VIBRA	214	X207	Pulsed vibra drive voltage	Vbat Off ~Vbat - 1.5V On	
VR1A	215	C241	GSM / WCDMA RF supply	4.75V	
VR1B	216	C236	WCDMA Tx supply	4.75V	
VR2	217	C234	GSM / WCDMA Tx supply	2.78V	
VR3	218	C235	TCXO supply	2.78V	
VR4	219	C233	GSM / WCDMA Rx supply	2.78V	
VR5	220	C235	GSM / WCDMA Rx supply	2.78V	
VR6	221	C234	WCDMA Rx VCO supply	2.78V	
VR7	222	C233	GSM VCO supply	2.78V	
SMPSCLK	223	J201	VTIKU regulator mode select	2.8V active mode 0V sleep mode	

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Calibration required when components changed

Table 1: Baseband Components

Component ID	NMP Code	Description	Calibration required
D200	4370945	UEME V2.0	Energy management calibration, GSM calibration
R200	1414605	CHIPRES 0R22	Charge calibration
R209	1430187	CHIPRES 100K 1%	BSI calibration
D451	4341497	8Mx16 FLASH	Energy management calibration WCDMA/GSM calibration
	435C067	Bluetooth	Reflash BT-NO CAL

Table 2: WCDMA Component Alignment

WCDMA TUNINGS	Power Detector Cal	RF Channel Filter Cal	Rx AGC Alignment	Rx Band Response Cal	Tx AGC Alignment	Tx Band Response Cal	Tx PA Bias Tuning	Temperature Sensor Cal
REX (N810)	NO	YES	YES	YES	NO	NO	NO	NO
RX SAW (Z800)	NO	NO	NO	YES	NO	NO	NO	NO
RX VCO (G800)	NO	NO	NO	NO	NO	NO	NO	ON
TEX (N900)	NO	YES	NO	NO	YES	YES	NO	YES
HEX (N902)	NO	NO	NO	NO	YES	YES	NO	NO
PA (N960)	YES	NO	NO	NO	YES	YES	YES	NO
TX VCO (G900)	NO	NO	NO	NO	NO	NO	NO	ON
Isolator (Z962)	YES	NO	NO	NO	YES	YES	NO	NO
TX SAW (Z900)	NO	NO	NO	NO	YES	YES	NO	NO
Duplexer (Z960)	YES	NO	YES	YES	YES	YES	NO	NO

Table 3: GSM Component Alignments

GSM TUNINGS	Rx Channel Select Filter Cal	Rx Cal	Rx Band Filter Response Cal	Rx DtoS Balance Cal	Tx IQ Tuning	Tx Power Level Tuning
HELGO (N600)	YES	YES	YES	YES	YES	YES
PA (N550)	NO	NO	NO	NO	YES	YES
ANT SW (Z500)	NO	YES	YES	YES	YES	YES
VCO (G650)	NO	NO	NO	NO	YES	NO
TX SAW (Z650)	NO	NO	NO	NO	NO	NO

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